The needs identified in this report produce impacts on different elements of the community. The elements of the community considered in this section include travel, business and industry, neighborhoods, agriculture, and the natural environment. The following section describes the impacts to each of these aspects in greater detail.

5.01 TRAVEL

A. Travel Conditions – 2030 Assuming 1.2 Percent Annual Growth

Analysis of 2030 traffic operations assuming 1.2 percent annual growth indicates that conditions on USH 51 will deteriorate because of substantial increases in total traffic volumes throughout the study corridor. Traffic modeling shows that while average delays at signalized intersections remain within acceptable ranges at most intersections, queuing of vehicles has the potential to block adjacent intersections and further hinder efficient traffic operations. The average delay experienced by drivers wishing to enter USH 51 from a side road at an unsignalized intersection is expected to reach unacceptable levels at almost all locations between Stoughton and McFarland. In some instances, a typical driver will have to wait more than three minutes before finding an adequate gap in traffic that will allow entrance to the highway. Safety may become an issue as high traffic volumes cause drivers to take more risks to enter and exit the highway. Figure 5.01-1 shows a long queue (approximately 2000 feet) on CTH B East during the AM peak hour in 2030 assuming 1.2 percent annual growth. The queue is a result of high volumes on USH 51 preventing CTH B East traffic from entering the highway.

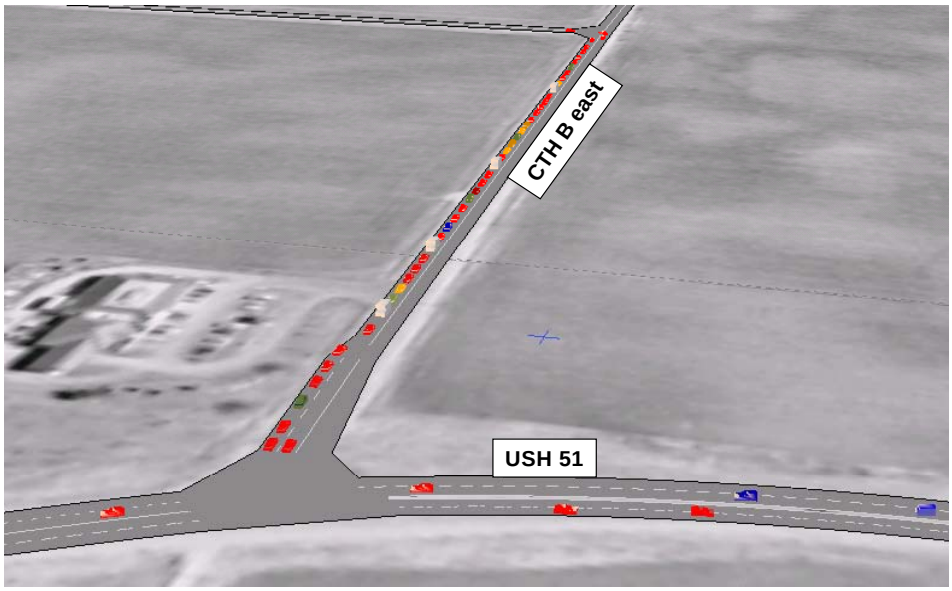

Figure 5.01-1 Screen Capture of Traffic Modeling Showing Queuing on CTH B East During the AM Peak Hour – 2030 Assuming 1.2 Percent Annual Growth

Passing slower moving vehicles on rural two-lane stretches of USH 51 between McFarland and Stoughton will become more and more difficult. Modeling shows that average travel speeds could drop as low as 40 mph even though the posted speed limit is 55 mph.

Traffic on adjacent streets and highways is expected to increase because some USH 51 traffic will use alternate routes as a result of deteriorating operations. The character of adjacent parallel routes will become less rural and more urban because of the larger traffic volumes. Travel between Madison, McFarland, and Stoughton will become more inconvenient and less desirable because of congestion and safety concerns, ultimately affecting local economies.

B. Travel Conditions – 2030 Assuming 1.8 Percent Annual Growth

If population growth rates observed from 1980 to 2000 continue from 2003 to 2030, operations modeling shows an even higher increase in congestion, user delay, safety concerns, and USH 51 traffic routing onto adjacent parallel routes. Traffic operations within Stoughton and McFarland would be

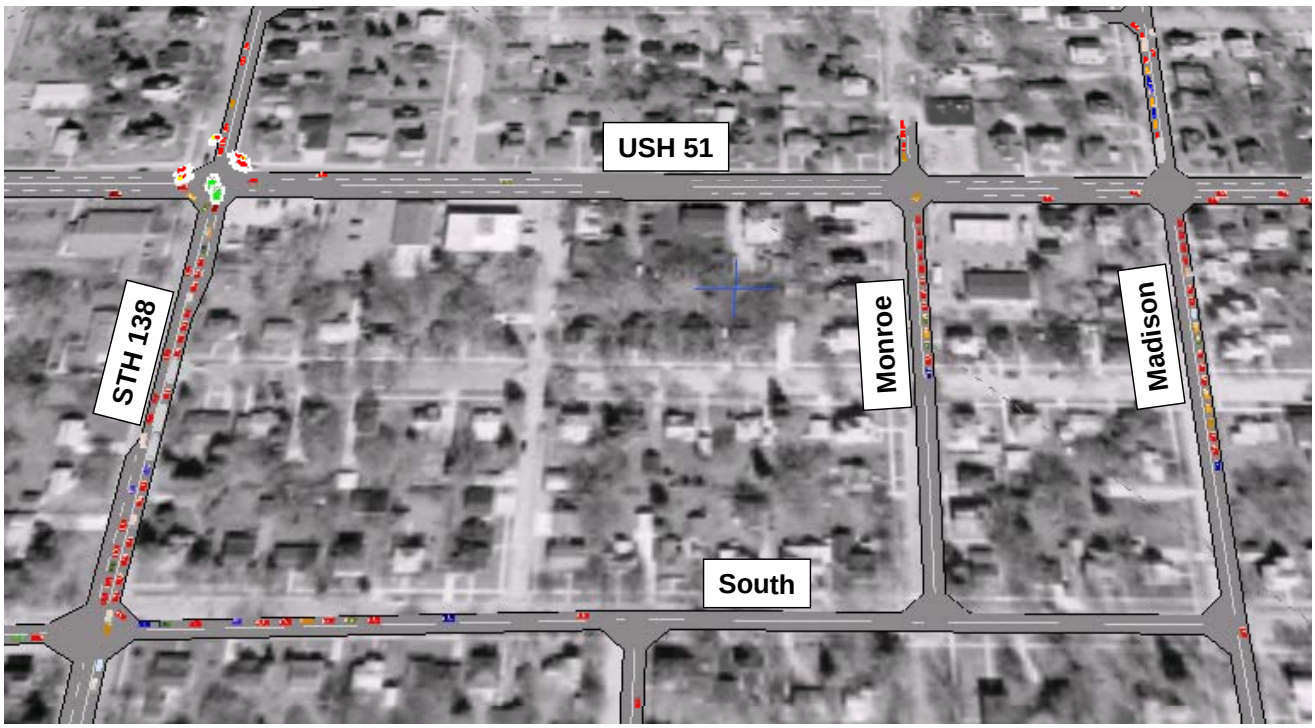

Figure 5.01-2 Screen Capture of Traffic Modeling Showing Long Queues at Both Signalized (STH 138) and Unsignalized (Monroe and Madison) Intersections Within the City of Stoughton During the AM Peak Hour – 2030 Assuming 1.8 Percent Growth

susceptible to complete breakdown because of streets operating over their capacities. Delays at all unsignalized and some signalized intersections on USH 51 would become extreme, and queuing that blocks adjacent intersections would become commonplace (see Figure 5.01-2). Modeling indicates that operations on rural two-lane stretches of USH 51 between Stoughton and McFarland would continue to worsen with average travel speeds expected to drop as low as 35 mph.

5.02 BUSINESS AND INDUSTRY

The deficiencies outlined in this report affect businesses and industries along the corridor. Congestion and perceived or real dangers tend to keep potential buyers away from businesses fronting the roadway. A lack of transit service and adequate bicycle and pedestrian facilities may also preclude certain segments of the population, such as the elderly or young people, from patronizing these stores. Business leaders from McFarland repeatedly mentioned the difficulty their patrons have safely entering and exiting commercial driveways and the lack of continuous sidewalks and safe pedestrian crossings of USH 51. Business leaders in Stoughton also noted difficulties entering and exiting the west side commercial areas, particularly when left turns are needed. Traffic through downtown Stoughton was rarely cited as a concern.

5.03 NEIGHBORHOODS

The roadway as it is today also affects almost everyone in the towns, City, and Village along the study corridor. It is the major roadway through the area and is considered McFarland and Stoughton's "main street." In some cases, the roadway separates neighborhoods from each other, not just physically but psychologically as well. It is moderately difficult for vehicles to cross the road, but for children on bicycles or on foot, crossing the roadway poses even more serious challenges. This is especially true in McFarland where the highway separates the bulk of the community from the Lake Waubesa waterfront. Lower speeds through the residential sections of Stoughton, the number of traffic signals, and numerous and well-marked crosswalks were often cited as possible improvements that would make USH 51 less of a barrier between neighborhoods.

5.04 AGRICULTURE

As it is now, the road presents some challenges to farmers who depend on USH 51 to bring their goods to market and move machinery from one field to another. The shoulders are not paved or of sufficient width to accommodate an entire tractor, for instance, so part of the roadway must be used. This slows down vehicular traffic, which results in irritated drivers and potentially stressful driving conditions for farmers.

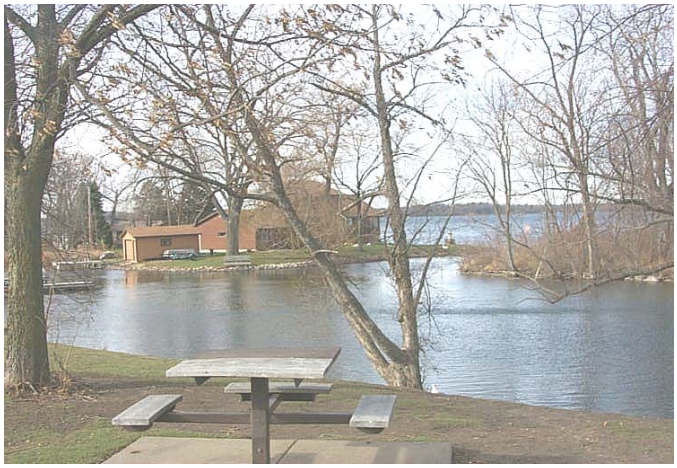

Figure 5.05-1 Babcock County Park on Lake Waubesa

5.05 NATURAL ENVIRONMENT

The USH 51 corridor travels 16.1 miles through a variety of sensitive natural and human environments. The Yahara River, Lake Waubesa, Lake Kegonsa, Mud Lake,

Babcock County Park (see Figure 5.05-1), Viking County Park, and numerous other natural areas are important resources for the region.

Motor vehicles impact local, regional, and global environments. Since the 1970 Clean Air Act, improvements to fuels and engine exhaust systems have drastically reduced the per-mile emissions of a properly operating highway vehicle. However, motor vehicles remain one of the most significant sources of pollution in this country, and the United States Environmental Protection Agency (EPA) notes "driving a private car is probably a typical citizen's most 'polluting' daily activity."[1]

Section 3.05 of this report states that future traffic modeling predicts traffic volumes in the corridor in 2030 will be approximately twice that of 2003 traffic volumes.

While the operational characteristics of a roadway affect the natural environment, the simple increase in vehicle-miles traveled will have the most significant effect. This predicted increase must be considered in the context of local, regional, and global environments.

A. Local and Regional Impacts

1. Hazardous Air Pollutants (HAPs)

The EPA, through the 1970 Clean Air Act, identifies 188 pollutants known or suspected to cause serious health or environmental problems, including cancer and birth defects. These chemicals are called hazardous air pollutants (HAPs), toxic air pollutants, or air toxics.

HAPs are dispersed locally and regionally, and they affect the quality of air, soil, and water. In turn, people are exposed to HAPs through their daily activities: breathing contaminated air, drinking contaminated water, and eating contaminated food.

In the United States, mobile sources account for 50 percent of the emissions of HAPs. Highway vehicles represent only a portion of those emissions, since off-road vehicles and equipment are also considered mobile sources.[2]

The HAPs present in vehicle exhaust are formed by incomplete combustion. Improvements in highway vehicles and their fuels prompted by the 1970 Clean Air Act have reduced the per-mile emissions of HAPs by new cars tenfold and by new trucks and buses twofold. Total HAP emissions are now lower than in 1970. However, vehicle-miles traveled continue to increase.

In addition to the chemical process of combustion, a vehicle's mechanical processes (such as braking) may release pollutants.

[1] From the USEPA's Fact Sheet OMS-5 (EPA 400-F-92-007)
[2] USEPA National Toxics Inventory.

HAPs released by highway vehicles include:

- Acetaldehyde
- Acrolein
- Benzene
- 1,3-Butadiene
- Chromium
- Diesel Particulate Matter (PM)
- Formaldehyde
- Nickel
- Polycyclic Organic Matter (POM)

Other HAPs are released through transportation-related processes such as petroleum refining and highway construction. The EPA is investigating possible health effects of methyl tertiary-butyl ether (MTBE).

2. Carbon Monoxide (CO)

Carbon monoxide (CO) is a colorless, odorless, poisonous gas produced during incomplete combustion. Motor vehicles account for 60 percent of carbon monoxide emissions in the United States, while in some urban areas, they account for 95 percent of carbon monoxide emissions. Carbon monoxide reduces the oxygen-carrying capacity of the blood. At concentrations found in an urban environment (30 ppm), it can impair visual and mental acuity. Individuals with heart disease are particularly vulnerable to carbon monoxide exposure.

Carbon monoxide is regulated by the EPA as one of seven Criteria Air Pollutants.

3. Ozone and Smog

Ground-level ozone causes eye irritation and lung damage and is especially dangerous to the young, the elderly, and those with respiratory problems. It is a primary constituent of photochemical smog. It harms plants and can reduce crop yields.

Ground-level ozone is formed by the reaction of hydrocarbons in the presence of nitrogen oxides (NO_X) and sunlight. Hydrocarbons and nitrogen oxides are produced by motor vehicles through incomplete combustion.

In Wisconsin, ground-level ozone is a significant summertime pollutant. Ozone, nitrogen oxides, and hydrocarbons are regulated by the EPA as Criteria Air Pollutants. At this time, Dane County meets the EPA's minimum requirements.

4. Acid Rain

In addition to contributing to ozone formation, atmospheric nitrogen oxides (NO_X) increase the acidity of rain, snow, and other forms of precipitation. This higher acidity can kill or otherwise harm plants and aquatic life. Acid rain also damages some building materials.

Nitrogen oxides are produced by motor vehicles through incomplete combustion. Motor vehicles are not a major source of sulfur dioxide, another chemical associated with acid rain that is produced primarily through coal combustion. Both nitrogen oxides and sulfur dioxide are regulated by the EPA as Criteria Air Pollutants.[3]

5. Particulate Matter

Particulate matter describes any airborne particles. Fine particulate matter (PM2.5) is defined as any particles less than 2.5 microns in diameter. These particles are rarely visible and can penetrate deep into the lungs. They trigger asthma, cause chronic bronchitis, and otherwise impede breathing. Fine particulate matter also contributes to haze.

Highway vehicles produce 10 percent of the fine particulate matter emitted in the United States. Diesel engines are a significant source of this particulate matter, and diesel particulate matter is a hazardous air pollutant (HAP) and suspected carcinogen.

6. Noise

Noise is defined as unwanted sound. The sounds generated by vehicular traffic can constitute noise to people and can interrupt normal activities when they reach certain levels. Other sources of noise can include railroads, airports, and manufacturing. Areas sensitive to noise include residential developments, recreational areas, schools, churches, cemeteries, and wildlife habitats. Commercial and industrial land uses are generally less sensitive to noise.

Sound Source	Sound Level (dBA)	Subjective Response
	140	Threshold of pain
Military jet takeoff with afterburner at 50 feet	130	
Rock and roll band	120	Uncomfortably loud
Jet fly-over at 1,000 feet	110	
Power lawn mower at operator	100	Very loud
Diesel truck (55 mph) at 50 feet	90	
High urban ambient sound automobile (55 mph) at 50 feet	80	Moderately loud
TV-audio, vacuum cleaner	70	
Normal conversation	60	
	50	Quiet
Lower limit urban ambient sound	40	
	30	Very quiet
Unoccupied broadcast studio	20	
	10	
	0	Threshold of hearing

Table 5.05-1 Typical A-Weighted Sound Levels

[3] From the United States Environmental Protection Agency (EPA)

Sound levels are measured in units called decibels. Since the human ear does not respond equally to all frequencies (or pitches), measured sound levels are often adjusted or weighted to correspond to the frequency response of human hearing and the human perception of loudness. The weighted sound level is expressed in units called A-weighted decibels (dBA) and is measured with a calibrated sound level meter. Table 5.05-1 provides an illustration of typical sound levels in dBA[4]. Sound levels that correlate with the human perception are also expressed with the descriptor L_{eq}. The term L_{eq} is defined as the equivalent steady-state sound level that, in a stated period, contains the same acoustical energy as the time-varying sound level during the same period.

TABLE 1

NOISE LEVEL CRITERIA
FOR CONSIDERING BARRIERS

Land Use Category	Leq(h)[1] (dBA)	Description of Land Use Category
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (Exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	—	Undeveloped lands.
E[2]	52 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Source: Wisconsin Administrative Code – Trans 405

Table 5.05-2 Noise Level Criteria for Considering Barriers

Trans 405 of the Wisconsin Administrative Code "sets forth the procedures and criteria used by WisDOT for evaluating and selecting site locations for noise barrier installation and for ensuring local participation in the siting process." Although it applies only to freeways and expressways, the chapter provides guidance as to acceptable noise levels. Table 5.05-2 shows the criteria for considering noise barriers.

C. Global Impacts

Carbon dioxide (CO_2) is a colorless and odorless gas and the primary atmospheric form of carbon. In the global carbon cycle, plant respiration, organic decay, and combustion release carbon dioxide into the atmosphere, and photosynthesis removes it. The ocean is both a major source and a major sink of carbon dioxide but has a minimal net effect on atmospheric carbon levels.

[4]Noise Assessment Guidelines Technical Background, HUD Report No. TE/N/A 172.
Handbook of Noise Control, C.M. Harris, 1979.
FHWA Highway Traffic Noise Prediction Model, FHWA-RD-77-108, 1978

Large-scale human activity since the Industrial Revolution has significantly increased the amount of carbon released through combustion, raising the atmospheric concentration of carbon dioxide by nearly 30 percent.

The higher concentration of carbon dioxide in the atmosphere, as well as that of several other greenhouse gases, has enhanced the Earth's greenhouse effect. The greenhouse effect is a natural phenomenon that maintains hospitable temperatures on the planet by trapping solar energy. As more solar energy is trapped, the Earth's climate is predicted to change. Changes in global temperature, snow cover, ice mass, and sea levels have already been observed.

Wisconsin's climate could undergo significant changes in the next century. A document prepared by the EPA that discusses the impacts of climate change on Wisconsin is included as Appendix F.[5]

Motor vehicles account for a third of Wisconsin's carbon dioxide emissions.[6] Unlike many of the pollutants discussed in the previous section, carbon dioxide is a product of *perfect* combustion. Advances in fuel efficiency, but not existing emission control technologies, can reduce the per-mile release of carbon dioxide.

[5] From the USEPA's Climate Change and Wisconsin (EPA 236-F-96-001)
[6] From Wisconsin Climate Change Action Plan, page 3.